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28 March 1962

MEMORANDUM FOR: Chief, Technical Plans and Development Staff, NPIC

SUBJECT: Automatic Read-out of Inertial Navigation System (INS)

REFERENCE: [redacted] Letter of 13 November 1961, OXC-2663 50X1

1. The Problem:

The requirement for digital recording of the Inertial Navigation System (INS) outputs used in guiding reconnaissance vehicles.

2. Assumptions:

That NPIC will continue to be engaged in the detailed exploitation of information obtained from various photographic reconnaissance collection systems.

3. Facts:

a. To properly exploit information obtained from modern photographic reconnaissance systems it is necessary to have the following data:

(1) Latitude and longitude of the photographic exposure.

(2) The orientation parameters of the photographic system at the instant of exposure.

(3) Absolute time of each exposure.

(4) The velocity of the vehicle.

(5) Values for the parameters of the image motion compensation system.

b. If the above information is not recorded directly at time of exposure it must be recovered by indirect methods of one sort or another. The time and effort to correlate these parameters varies from simple formulae manipulation to complicated and time consuming projects.

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c. NPIC is purchasing a 490 Univac computer. Anticipated on-line use of this computer with the '0' program requires early access of automated INS information.

4. Discussion:

a. In past and present reconnaissance collection programs, the parameters necessary for quantative exploitation of photography, including the elements of orientation of the camera station, geodetic position, altitude and velocity, have been determined by graphical means, mathematical derivations, and at times by assumption.

b. The adoption of an automatic INS read-out system will enable immediate exploitation of a reconnaissance system. At present in TID a large investment of time is applied to plotting, and the computation of the orientation parameters of the photographic system.

c. The potential capability of the OXCART program indicates that the missions will be scheduled for targets of high priority requiring technical intelligence exploitation. Pioneer coverage will probably continue to be provided by satellites. Technical intelligence exploitation will levy rigid requirements of accuracy and completeness of the requisite technical flight data.

d. NPIC is developing a real-time computer system around the Remington-Rand Univac 490 computer. This computer has the capability of storing all the technical parameters requisite for quantitative exploitation and the real-time system can only work efficiently if these technical parameters are stored in the computer memory prior to the intelligence reporting phase.

5. Conclusion:

a. The stated accuracy in latitude and longitude given by [redacted] 50X1 (see reference) is sufficiently accurate to produce an automatic plot of the resultant exposures. The accuracy of the attitude parameters, pitch, roll and yaw, as stated by [redacted], are sufficiently accurate 50X1 to satisfy 95% of the photo-interpreters mensuration requirements. The largest source of error has been in our inability to obtain a satisfactory altitude. Every endeavor to improve the accuracy of the altitude should be made. What is desired is an altitude accurate to at least 1% or better. However, if the altitude cannot be obtained to within 1% or better the INS automatic attitude read-out is none-the-less desirable. To restate our requirements the accuracy anticipated by [redacted] is sufficient for 95% of our requirements (charting and 50X1

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mapping organizations may have more stringent requirements but it is for their representatives to state what their requirements may be.)

b. It is believed that with the digital recording of the INS output that an additional 20 to 25% of TID effort could be directed to the timely resolution of Joint National requirements.

c. The anticipated use of the Univac 490 makes it mandatory that an automatic INS package be available at an early date, if this is not done the recovery of the orientation parameters etc. will delay the early and timely dissemination of intelligence information to the community by a factor of at least 7 - 10 days, especially as far as the JN requirements are concerned.

d. An Inertial Navigation System provides a capability never before available in that all the orientation, time, and position parameters are sensed and can be recorded. INS, possibly coupled with stellar or solar sensing, will, in all probability, be the way of the future in both cartographic and reconnaissance systems.

6. Recommendations:

Holding to the specifications stated by [redacted] it is recommended that development of the digital read-out of the INS proceed as soon as feasible looking not only to the GK system but of such automation in satellite photography collection systems. 50X1

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